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ABSTRACT

The purpose of this study was to describe the development and validation of a questionnaire on students' motivation toward science learning (SMTSL). Researchers characterized the features of students' motivation toward science learning as self-efficacy, active learning strategies, science learning value, performance goal, achievement goal, and learning environment stimulation. These provided the basis for this study to develop SMTSL. A pilot study with 315 8th graders was held to revise the questionnaire. After the revision, a total of 35 items in the SMTSL constituting 6 sub-scales was administered to an effective sample of 1,407 Taiwanese junior high school students varying in grades, sex, and ability levels. Reliability and validity of the questionnaire were established based on Cronbach alpha, factor analysis, and correlation tests. The results indicated that Cronbach alpha for the entire questionnaire was 0.89; for each scale, alpha ranged from 0.70 to 0.89. There was significant correlation ($p<.0001$) of the SMTSL with students' science attitudes ($r=0.41$) and science academic achievement ($r=0.38$). Students with high, moderate, and low motivation toward science showed significant difference ($p<.0001$) on their SMTSL scores. Findings of the study confirmed the validity and reliability of the SMTSL questionnaire. (Contains 32 references.) (Author/MM)

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The development of a questionnaire for assessing students' motivation toward science learning

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Abstract

The purpose of this study was to describe the development and validation of a questionnaire on student' motivation toward science learning (SMTSL). Researchers characterized the features of students' motivation toward science learning as self-efficacy, active learning strategies, science learning value, performance goal, achievement goal and learning environment stimulation. These provided the basis for this study to develop SMTSL. A pilot study with 315 8th graders was held to revise the questionnaire. After the revision, a total of 35 items in the SMTSL constituting 6 sub-scales was administered to effective sample of 1407 Taiwanese junior high school students varying in grades, sex and ability levels. Reliability and validity of the questionnaire were established based on Cronbach alpha, factor analysis, and correlation tests. The results indicated that Cronbach alpha for the entire questionnaire was 0.89; for each scale, alpha ranged from 0.70 to 0.89. There were significant correlation ($p<.0001$) of the SMTSL with students' science attitudes ($r=0.41$), and science academic achievement($r=.38$). Students with high, moderate and low motivation toward science showed significant difference ($p<.0001$) on their SMTSL scores. Findings of the study confirmed the validity and reliability of the SMTSL questionnaire.

Keyword: learning motivation, science learning, questionnaire development, junior high school

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Objectives of the study

The goal of science education is to enhance all students' scientific literacy. The intention behind this goal is to help students grasp the essential science concepts and willing to continue their study in science. On the other hand, in school science teaching, teacher should address on students' cognitive and affective dimensions. However, previous science education research was mainly focused on students' cognition instead of their affection (Brickhouse, 1998; Duit & Treagust, 1998; Duschl & Hamilton, 1998; Scott & Driver, 1998). Not until recently, researchers started to advocate to integrate the affective domain into students' concept learning (Duit & Treagust, 1998; Lee, 1989, 1996; Pintrich, Marx, & Boyle, 1993; Pintrich, Marx & Boyle, 1993; Strike & Posner, 1983, 1992; West & Pines, 1983). Among affective domain, motivation is the area highly recommended by many researchers (Lee, 1989, 1996; Pintrich, Marx, & Boyle, 1993), because it can influence students' conceptual change processes. In fact, previous research have found out students' motivation have correlation with affective determination, achievement (Napier & Riley, 1985), their critical thinking, and learning strategies (Garcia & Pintrich, 1992). Therefore, investigating students science motivation can be helpful to understand students' affection and cognition in learning science.

Although assessing students' motivation toward science learning is becoming an important research area to investigate, previous researchers (Meece & Jones,1996; Midgley, Maehr,& Urdan,1993) usually assess students' motivation by some kind of questionnaire after implementing innovative instruction. However, many motivation questionnaires were not designed purposeful for assessing students' science learning. Researchers (Blumenfeld, 1992; Blumenfeld & Meece, 1988; Lee & Anderson, 1993; Lee & Brophy, 1996, Weiner, 1990) suggested that there is a need to consider students' motivation within subject content. In addition, not many questionnaire established validity and reliability results in the paper. Based on the above reasons, the purpose of this study is to develop a questionnaire for assessing students' motivation toward science learning, and to establish the validity and reliability of the questionnaire.

Theoretical framework

Learning motivation

Based on the previous researchers' investigations in the area of students' learning motivation(Garcia & Pintrich, 1991a; Garcia & Pintrich, 1991b; Nolen & Haladyna, 1989; Pintrich & Blumenfeld, 1985), several constructs appeared frequently were: self-perceptions of ability, effort, intrinsic goal orientation, task, value, self-efficacy, test anxiety, self-regulated learning, task orientation and strategy-learning value.

Other scholars suggested exploring learning motivation such as achievement motivation, and concept of self were important. In science learning area, Pintrich, Marx and Boyle (1993) discussed on several motivation constructs -- goals, values, self-efficacy, control beliefs, concept of self and students' role in the class, which might influence students' process of conceptual change.

Basically, research done on assessing students' motivation used motivation questionnaire. These questionnaires were designed for serving different purposes in different research. For instance, Garcia and Pintrich (1991a, 1992) used the Motivated Strategies for Learning Questionnaire (MSLQ) to assess students' motivation and its relationship with students' cognitive strategies. In the MSLQ, it consisted of intrinsic motivation, goal and value of the courses, self-efficacy, different cognitive and meta-cognitive strategies, and self-regulated learning.
Meece and Jones (1996) used confidence, motivation goals (task mastery, ego, and work avoidance) and learning strategies (active and superficial) to develop their motivation questionnaire. Midgley, Maehr, and Urdan (1993) developed a Patterns of Adaptive Learning Survey (PALS) questionnaire containing seven scales--self-efficacy, surface strategies, deep strategies, value, self-concept of ability, expectancy, ability goal orientation, and learning goal orientation. Among the above research, it could reveal that students' self-efficacy, learning strategies, their learning goal (for learning, competition or for their ego), and their value of the tasks were very important areas for investigation.

Students' motivation toward science learning

Reviewing literature, there were few studies done on students' motivation toward science learning (Barlia & Beeth 1999; Erb, 1996; Lee & Anderson, 1993; Lee & Brophy, 1996; Meece & Jones, 1996). Among these empirical studies, Lee and Brophy (1996) used qualitative method to classify students' motivation patterns. Barlia and Beeth (1999) confirmed Lee and Borphy's motivation patterns in college physics learning. Meece and Jones (1996) investigated the motivation between boys and girls at 5th grade, and found out no significant difference among them. However other research have found out boys and girls have different level of motivation; usually boys are at higher level than girls (Cannon & Simpson, 1985; Hynd, Holschuh, & Nist, 2000; Simpson & Oliver, 1985). Erb (1996) found out high school students' lack of motivation in learning science were caused by: 1) students' lack of responsibility; 2) students have low self-esteem, and 3)had possible family dysfunction.

Factors influenced on students' motivation toward science learning

Researchers found out factors which influenced on students' motivation toward science learning (Lee, 1989; Hynd, Holschuh & Nist, 2000; Nolen & Haladyna, 1989) were:

1) students' own interests toward the subjects and the grades they got in the class (Hynd, Holschuh & Nist, 2000);
2) students' interpretations of the nature of the task; their success or failure to make a progress in scientific understanding; their general goal and affective orientations in science class and achievement of scientific understanding (Lee, 1989).

Besides students' own reason, other factors could influence on students' motivation were teacher, curriculum and social goal (Lee, 1989; Nolen & Haladyna, 1989; Pintrich & Blumenfeld, 1985; Urdan & Maehr, 1995). For instance, teachers' expectation of students' learning (Nolen & Haladyna,1989) and the types of teachers' feedback (Pintrich & Blumenfeld, 1985).

Based on the findings from the previous research, there are two aspects can be addressed in developing students' motivation toward science learning, one is from students' own perspective, such as their self-efficacy, goals and value of the tasks, another aspect should be from teacher's teaching or curriculum. These two aspects would put into designing motivation questionnaire consideration.

Design and Procedure

This study applied both qualitative and quantitative methods in developing SMTLS. In the beginning of the study, researchers modified PALS items and added new items generated from classroom observations and interview with students (Tuan & Chin, 1999). After questionnaire has been designed, researchers invited 2 educational psychologists, 4 science educators, and 4 experience science teachers to check content validity. The questionnaire was then implemented to four classes, in company with interviewing 6 students from each class to check facial validity of the questionnaire. Based on the pilot study with 315 students, the reliability of entire questionnaire and each scale is very high (>.70) (Tuan & Chin, 2000). However, the factor loading was not appropriate. Researchers then asked the above four classes (315) of ninth graders to fill out open-ended questionnaire on "Why are you motivated in learning physical science and why are you not motivated in learning science?". In addition, four physical science classes were conducted for writing case study to investigate students' motivation toward science learning (Tuan & Chin, 2000; Wu, 2000; Whang, 2001; Whang, 2002). These findings revealed that students' motivation toward science learning were related to students' themselves, the teacher's teaching, and the science content itself, these findings were confirmed with previous research (Lee, 1989; Nolen & Haladyna, 1989; Pintrich & Blumenfeld, 1985).

Based on open coding analysis of the open-ended questions (Tuan & Chin, 2000), in the SMTSL, we created one scale on environment learning stimulation which referred to teacher's teaching and the curriculum that stimulate students' motivation toward science learning. Besides learning environment stimulation, the other scales were: self-efficacy, active learning strategies, science learning value, performance goal, and achievement goal, these scales were used very often in the previous research done on students' motivation (Garcia & Pintrich, 1991a, 1992; Midgley, Maehr, & Urdan, 1993 ;Pintrich, Marx & Boyle, (1993). The detail description and example item were listed in table 1.

Table1: Description of Scales and a Sample Item for each scale of the SMTSL

Category	Item #	Description	Example items
Self-Efficacy (SE)	7	Students are sure that when they put an effort into science learning, they can accomplish the learning task.	I am not confident about understanding difficult science concepts.
Active Learning Strategies (ALS)	8	Students take an active role in using many ways to construct new knowledge form their previous understanding.	When learning new science concepts, I connect them to my previous experiences.
Science Learning Value (SLV)	5	Students are motivated to learn science because they perceive there is value in learning science.	I think that learning science is important because I can use it in my daily life.
Performance Goal (PG)	4	The student's goal in science learning is to perform better than other students.	I participate in science courses to perform better than other students.
Achievement Goal (AG)	5	Students feel fulfilled as they increase their ability during science learning.	During a science course, I feel most fulfilled when I attain a good score in a test.
Learning Environment Stimulation (LES)	6	The classroom learning environment, such as the curriculum content, teacher' generated psycho-social learning environment increase the students' willingness to learn science.	I am willing to participate in this science course because the content is exciting and changeable.

After designing the SMTSL, researchers used random stratified sampling to identify 15 senior high schools allocated in central Taiwan, each school random selected one class of seventh, eighth and ninth graders to implement questionnaire. There were 2100 students filled the SMTSL, the effective sample were 1407. Researchers also collected students' science achievement scores from the previous and current semester and used science attitude tests to conduct validity test for

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SMTSL.

Findings

In order to examine the validity of the SMTSL, researchers used factor analysis to examine the constructs of the questionnaire, results were listed in Table 2.

Table 2：Factor loading of items in the SMTSL (N=1407)

		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
SE	Q1	.57					
	Q2*	.74					
	Q3	.66					
	Q4*	.68					
	Q5*	.59					
	Q6*	.55					
	Q7*	.63					
ALS	Q8		.65				
	Q9		.68				
	Q10		.63				
	Q11		.67				
	Q12		.69				
	Q13		.62				
	Q14		.63				
	Q15		.60				
SLV.	Q16			.57			
	Q17			.63			
	Q18			.50			
	Q19			.58			
	Q20			.64			
PG	Q21				.72		
	Q22				.83		
	Q23				.84		
	Q24				.77		
AG	Q25					.71	
	Q26					.64	
	Q27					.68	
	Q28					.76	
	Q29					.72	
LES	Q30						.65
	Q31						.75
	Q32						.67
	Q33						.67
	Q34						.42
	Q35						.43

All loadings smaller than 0.4 have been omitted. *: reversed item.

Table 3 : Internal consistency (Cronbach alpha) and Discriminate validity (Mean correlation with other scales), mean and standard division for the (N=1407)

Scale	Item #	Mean	SD	Cronbach α	Discriminative Validity
Entire Questionnaire	35	120.01	15.57	0.89	
SE	7	23.37	5.25	0.82	0.31
ALS	8	29.62	5.22	0.87	0.39
SLV	5	18.76	3.05	0.70	0.51
PG	4	9.06	3.02	0.81	0.09
AG	5	19.39	3.41	0.80	0.30
LES	6	19.48	4.05	0.75	0.32

Table 4: Pearson Correlation analysis of SMTSL with science achievement and attitude

Pearson Correlation	Achievement^{F}	Achievement^{C}	Attitude
SMTSL	.37****	.38****	.41****

Note: ****refers to p<.0001

Achievement^{F}: Referes to students' science achievement scores in the former semester.

Achievement^{C} :Referes to students' science achievement scores in the current semester.

Table 5: One-Way ANOVA on the different motivation students' results on SMTSL

		Sum of Squares	df	Mean Square	F	Post Hoc Tests
Entire Questionnaire	Between Groups	25288.62	2	12644.31	58.38****	HM>MM****; HM>LM****; MM>LM****
	Within Groups	77971.03	360	216.59		
	Total	103259.65	362			
SE	Between Groups	3347.14	2	1673.57	88.72****	HM>MM****; HM>LM****; MM>LM****
	Within Groups	6715.71	356	18.86		
	Total	10062.85	358			
ALS	Between Groups	2494.03	2	1247.01	56.46****	HM>MM****; HM>LM****;

						MM>LM****
	Within Groups	7840.91	355	22.09		
	Total	10334.94	357			
SLV	Between Groups	232.43	2	116.21	11.43****	HM>LM****; MM>LM*
	Within Groups	3610.17	355	10.17		
	Total	3842.59	357			
PG	Between Groups	107.54	2	53.77	6.36***	HM>LM** MM>LM*
	Within Groups	3036.84	359	8.46		
	Total	3144.38	361			
AG	Between Groups	570.55	2	285.28	28.68****	HM>LM****; MM>LM****
	Within Groups	3511.89	353	9.95		
	Total	4082.44	355			
LES	Between Groups	471.37	2	235.69	12.97****	HM>MM** HM>LM****
	Within Groups	6398.76	352	18.18		
	Total	6870.12	354			

Note: ****p<.0001; ***p<.001; **p<.01;*p<.05

HM:High motivation; MM: Moderate motivation; LM: Low motivation

The results from Table 1, indicated the there were six factors which had eigen value larger than 1.0, and these factors constituted an optimal structure of the SMTSL, each item was allocated in it's own scale, thus, the validity of the SMTSL was appropriate. In Table 2 the Cronbach alpha for the entire questionnaire was 0.89, and for each of the scale Cronbach alpha ranged from 0.81 to 0.70. These Cronbach alphas confirmed the satisfied internal consistence of the SMTSL. The discriminative validity referred to the mean correlation with other scales, in STMSL the data was ranged from 0.09 to 0.51. It depicted the distinct of each scale, and each scale also has

some overlapping with other scales.

Besides the internal consistence and validate of the SMTSL, we also correlated SMTSL with science attitude, the results indicated that there was significant correlation between SMTSL and science attitude ($r=0.41$, $p<.0001$). In other words, students' motivation towards science learning was related to their science attitude. We also correlated SMTSL with students' science learning achievement, the Pearson correlation showed that there were significant difference with students' SMTSL scores with their science achievement scores in the previous semester and current semester ($r_p=0.37$, $r_c=0.38$, $p<.0001$). These findings confirmed with (Napier & Riley, 1985) study, that students' motivation have correlation with affective determination and achievement.

In terms of whether SMTSL could differentiate students' with different motivation. Researchers ranked students' motivation scores into three categories, these were high motivators, moderate motivators, and low motivators. For the high motivators their scores ranged from mean score plus one standard deviation. For moderate motivator their score equal to means score. For the low motivators, were the students whose allocated in score mean score minus one standard deviation. One way ANOVA analysis indicated that there were significant difference ($p<.0001$) among students with high, moderate and low motivation toward science learning, this confirmed the construct validity of the SMTSL. For the scales, such as self-efficacy and active learning strategies could also distinguish among high, moderate and low motivators. The rest of the scales could distinguish at least between high and low motivators.

Conclusion

The purposes of the study were to develop a questionnaire that could measure students' motivation toward science learning. Based on the qualitative and quantitative data collection, there were six scales generated in the SMTSL, these were: self-efficacy, active learning strategies, science learning value, performance goal, achievement goal and learning environment stimulation.

Based on the reliability and validity analysis, it showed that there were satisfactory reliability and factor structure of the SMTSL. The SMTSL could also differentiate students with high and low motivation toward science learning. Based on the motivation literature, motivation was individual's internal drive to accomplish their goal, thus motivation should have some correlation with students' attitude and also with their achievement scores. The results indicated that SMTSL has significant correlation with both students' science attitude and also with their science achievement scores in the previous and current semester. Thus this questionnaire had both satisfactory results on reliability and validity tests.

We suggested that SMTSL can be used to examine how students' concept construction in correlated with their motivation in particulate science unit, so that we could uncover scholars' ((Duit & Treagust, 1998; Lee, 1989, 1996; Pintrich, Marx, & Boyle, 1993; Pintrich, Marx & Boyle, 1993; Strike & Posner, 1983, 1992; West & Pines, 1983) suspicion of the motivation influenced on students' conceptual change. This questionnaire could also help science teachers to assess students' motivation in science area and in particular science unit, so that he/she could find a way to improve students' motivation in science learning.

Reference

Barlia, L. & Beeth, M.E. (1999). *High school students' motivation to engage in conceptual change learning in science.* Paper presented at the annual meeting of the National Association for Research in Science Teaching, Boston, MA, March 28, 1999.

Blumenfeld, P. C. (1992). Classroom learning and motivation. Clarify and expanding goal theory. *Journal of Educational Psychology, 84* , 272-281.

Blumenfeld, P. C., & Meece, J. L. (1988). Task factors, teacher behavior, and students' involvement and use of learning strategies in science. *The elementary school journal, 88*, 235-250.

Brickhouse, N. W. (1998). Conceptual change in science and in the learning of science. In B. Fraser, & K. Tobin (eds.) *International handbook of science education (pp.1047-1066).* Dordrecht, The Netherlands: The Kluwer academic publisher.

Cannon, R. K. & Simpson, R. D. (1985). Relationships among attitude, motivation, and achievement of ability grouped, seventh-grade, life science students. *Science & Education, 69*(2), 121-38.

Duit, R. & Treagust, D. (1998). Learning in science—From behaviorism towards social constructivism and beyond. In B. Fraser, & K. Tobin (eds.) *International handbook of science education (pp. 3-26).* Dordrecht, The Netherlands: The Kluwer academic publisher.

Duschl, R. A. & Hamilton, R. J. (1998). History and Philosophy of science in the science curriculum. In B. Fraser, & K. Tobin (eds.) *International handbook of science education (pp.1027-1046).* Dordrecht, The Netherlands: The Kluwer academic publisher.

Erb, M. (1996). *Increasing students' responsibility for their learning through multiple intelligence activities and cooperative learning.* Unpublished master thesis at , Saint Xavier University, US, Illinois.

Garcia, T. & Pintrich, P. R. (1991a). *Student motivation and self-regulated learning: A LISREL model.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL, April 3-7, 1991.

Garcia, T. & Pintrich, P. R. (1991b). *The effects of autonomy on motivation, use of learning strategies, and performance in the college classroom.* Paper presented at the annual convention of the American Psychological Association, San Francisco, CA, August, 1991.

Garcia, T. & Pintrich, P. R. (1992). *Critical thinking and its relationship to motivation, learning strategies, and classroom experience.* Paper presented at the Annual Meeting of the American Psychological Association, Washington, DC, August 14-18, 1992.

Haladyna, T., & Thomas, G. (1979). The attitudes of elementary school children toward school and subject matters. *Journal of Experimental Education, 48*(1), 18-23.

Hynd, C., Holschuh, J., & Nist, S. (2000). Learning complex scientific information: Motivation theory and its relation to student perceptions. Reading & Writing Quarterly: *Overcoming Learning Difficulties, 16*(1), 23-57.

Lee, O. (1989). *Motivation to learning science in middle school classrooms. University Microfilms International.* Michigan State University Ph.D.

Lee, O. & Anderson, C. W. (1993). Task engagement and conceptual change in middle school science classrooms. *American Educational Research Journal, 30*(3), 585-610.

Lee, O., & Brophy, J. (1996). Motivational patterns observed in sixth-grade science classrooms. *Journal of Research in Science Teaching, 33*(3), 585-610.

Main, R.G. (1993). Integrating motivation into the instructional design process. *Educational Technology* , 33(12) , 37-41

Meece, J. L. & Jones, M. G. (1996). Gender differences in motivation and strategy used in science: Are girls rote learners? *Journal of Research in Science Teaching, 33*(4), 393-406.

Midgley, C., Maehr, M. L., & Urdan, T. C. (1993). *Patterns of adaptive learning survey.* Ann Arbor, MI: University of Michigan Press.

Napier, J. D. & Riley, J. P. (1985). Relationship between affective determinants and achievement in science for seventeen-year-olds. *Journal of Research in Science Teaching, 22*(4), 365-83.

Nicholls, J. G., Nolen, S. B., Patashnick, M. (1985). Adolescents' theories of education. *Journal of Educational Psychology, 77*(6), 683-692.

Nolen, S. B. & Haladyna, T. M. (1989). Psyching out the science teacher: Students motivation, perceived teacher goals and study strategies. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, March 27-31, 1989.

Pintrich, P. R. & Blumenfeld, P. C. (1985). Classroom experience and

children's self-perceptions of ability, effort, and conduct. *Journal of Educational Psychology, 77*(6), 646-57.

Pintrich, P. R., Marx, R. W., & Boyle, R. A. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. *Review of Educational Research, 63*(2), 167-199.

Scott, P. H. & Driver, R. H. (1998). Learning science through models and modeling. In B. Fraser, & K. Tobin (eds.) *International handbook of science education (pp.53--66).* Dordrecht, The Netherlands: The Kluwer academic publisher.

Simpson, R. D. & Oliver, J. S. (1985). Attitude toward science and achievement motivation profiles of male and female science students in grade six through ten. *Science & Education, 69*(4), 511-26.

Strike, K. A., & Posner, P. J. (1983). On rationality and learning: A reply to West and Pines. *Science Education, 67*, 41-43.

Strike, K. A., & Posner, P. J. (1992). A revisionist theory of conceptual change. In R. A. Duschl & R. J. Hamilton (Eds.), *Philosophy of science, cognitive psychology, and educational theory and practice (pp. 147-176).* Albany: State University of New York Press.

Tuan, H. L. & Chin, C. C. (1999). *Promoting junior high school students' motivation toward physical science learning (I).* Report for National Research Council (NSC 88-2511-S018-013).

Tuan, H. L. & Chin, C. C. (2000). *Promoting junior high school students' motivation toward physical science learning (III).* Report for National Research Council (NSC 89-2511-S018-030).

Urdan, T. C. & Maehr, M. L. (1995). Beyond a two-goal theory of motivation and achievement: A case for social goals. *Review of Educational Research, 65*(3), 213-43.

Weiner, B. (1990). History of Motivational Research in Education. *Journal of Educational Psychology. 82*(4), 616-622.

West, L. H. T., & Pines, A. L. (1983). How "rational" is rationality? *Science Education, 67*, 37-39.

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